InPractice

# Diagnosis and management of the itchy horse



| | |
|---|---|
| Journal: | *In Practice* |
| Manuscript ID | INPRACT.2018.100689.R1 |
| Article Type: | Clinical |
| Date Submitted by the Author: | n/a |
| Complete List of Authors: | Curnow, Ben; University of Liverpool School of Veterinary Science |
| Keywords: | Dermatology, Pruritus, Equine, Ectoparasites, Allergy, Treatment |
| | |

# Diagnosis and management of the itchy horse

Out in the field, it can be particularly challenging to work up a case of the itchy horse. The history can be vague, the patient is large with a dense coat, and the microscope is located back at the practice. Management can also cause frustration for both the clinician and the client, with tasks that may be manageable for a dog and cat proving impractical in ponies and horses. The aim of this article is to outline some of the common causes of pruritus in horses, how to get an accurate diagnosis, and how to effectively treat them.

## Introduction

Although the definition of pruritus has been stated as the 'unpleasant sensation that triggers a desire to scratch' (Ikoma et al, 2006), scratching is not necessarily a clinical sign readily displayed by horses that are pruritic. They are far more likely to bite, rub, or chew at sites that are itchy, and these signs are considered indicative of pruritus in equine medicine. The presentation of pruritus in horses is highly distressing to owners. Not only can the horse inflict a significant degree of self-trauma, but paddock fencing, field shelters, and even expensive rugs will not go unharmed in a horse's attempt to resolve a persistent itch. Home therapies are numerous, and it is rare that clinicians are not presented with a patient that has not already been bathed in shampoo or cream that may or may not have ingredients stated on the bottle. Therefore, a good history is paramount, followed by a suitable clinical examination and sampling. Most dermatological samples obtained from a primary visit can be interpreted in-house for a very limited cost. All that is required is a decent microscope, slides, and paraffin oil.

## History

A thorough history should be acquired when dealing with a pruritic case. Signalment of a case is obviously important (age, breed, sex, etc), but much of what needs to be acquired can be ascertained from six questions (White, 2015):

- Check that the horse is pruritic. Pruritus often presents with chewing/biting, stamping, or rubbing. This can be focal or generalised in distribution, with many secondary skin changes appearing from self-inflicted trauma.
- How did the problem present and how has it changed?
- How has the owner treated the horse, and what effect has this had? This is especially important, as owners will have inevitably applied something to the skin, whether ingredients are stated on the bottle, or not.
- What is the horse's normal routine and environment? It is also important to gauge whether or not the horse has contact with other horses, and if any other in-contacts (horses/humans) are affected regarding contagion.
- What is the horse's diet (including turnout pasture)?
- Is there a seasonality to the horse's pruritus, or any potential triggers?

## Physical Examination

A general examination of the horse is vital. This could reveal indicators of another cause for dermatological disease and pruritus, such as pars pituitary intermedia dysfunction (PPID), pemphigus foliaceus, or liver disease (Knottenbelt, 2012). It is important to move the horse into a well-lit area for dermatological examination, not only to identify any possible ectoparasites, but to characterise the lesions and clinical pattern of the case presentation.

It is imperative to discern whether the pruritus is generalised or focused to a particular bodily region. This can significantly affect the likelihood of certain differential diagnoses (Figure 1).

## What samples to take?

**Infectious dermatoses**: Suspicion of parasitic cause for pruritus in equine species is of high priority, and sampling is relatively straight forward. Equipment required for sampling is listed in Box 1. Samples that should be taken upon an initial consultation are as follows:

- **Coat brushings**: Brush the coat using a stiff brush. The author prefers the use of a denture tooth brush, and a clear petri-dish for collection of extracted material. Follow this exercise by clipping the area brushed and repeating the brushing process. This can help to readily capture mites and lice hiding deeper beneath heavily coated/feathered areas (Bergvall, 2005).
- **Hair plucks:** These can be used for identification of louse eggs (Bergvall, 2005). Should dermatophytosis be suspected, peripheral lesion hair plucks can be submitted for rapid dermatophyte qPCR, or fungal culture as a gold standard. These should be stored in a sterile bottle or paper envelope for transport.
- **Tape strips**: Acetate tape strips can be applied to pruritic areas for use in identifying mites and lice. In cases of tail head/rump pruritus, it is imperative to sample the perianal area with scotch tape to identify *Oxyuris equi* eggs (Reinemeyer & Nielsen, 2014).
- **Cytology**: Exudative lesions can readily be sampled by impression smear onto a microscope slide or acetate tape, and cytology of the impression viewed by Wright-

Giemsa (Diff-Quik) stain. This technique is particularly useful in gaining a rapid diagnosis of pyoderma.

Box 1: A consolidated list of items that are useful for dermatological investigations.

- Sellotape
- Scissors
- Microscopy Slides
- Paraffin Oil + Pipette
- Scalpel Blades
- Artery Forceps
- Denture Toothbrush
- Petri-dish
- Local Anaesthetic
- Biopsy Punch (6-8mm)
- Microbiological Swabs
- Sampling Pots

Should these samples not produce a significant diagnosis, the second consultation should involve the collection of **skin scrapings** and possible **punch biopsy**, depending on the clinical picture. Superficial scrapes can be used to identify parasites such as *Chorioptes spp* (Figure 2) and *Trombicula autumnalis.* Deeper scrapings can be used for identification of burrowing mites, such as *Demodex spp*, which could be suspected in PPID or systemically compromised

patients (Bergvall, 2005) (Knottenbelt, 2012), but are exceptionally rare in the equine patient. If no parasites can be identified, it is still justified to treat for parasitic causes prior to investigation of other pruritic diseases (Figure 3). Tissue culture can be performed from punch biopsy should dermatophilosis be suspected. Multiple punch biopsies (at least 12) should be taken following cytological indication if an attempt to diagnose pemphigus foliaceus is to be made (Vandenabeele et al, 2004). This will normally present with crusting and possible pruritus. Other rare causes of pruritus, such as hepatocutaneous syndrome or paraneoplastic pruritus (Figure 4), require further blood work to aid in diagnosis, and even possible rectal palpation and abdominal ultrasonography.

The most common parasitic and infectious aetiologies are outlined below (Table 1), along with their appropriate treatments (Table 2).

| **Infectious** | **Immunological** | **Miscellaneous** |
|---|---|---|
| Lice: *Haematopinus asini*, *Damalinia equi* | Atopic Dermatitis | Drug reaction |
| Mites: *Chorioptes spp*, *Sarcoptes scabei*, *Trombicula autumnalis*, *Dermanyssus gallinae* | *Culicoides* hypersesnitivity | Hepatic dysfunction |
| Biting flies and insects | Contact hypersensitivity | Multisystemic eosinophilic epitheliotropic syndrome |
| Fungal: Dermatophilosis, *Malassezia* dermatitis | Food allergy | Paraneoplastic pruritus |
| Bacteria: Dermatophytosis, pyoderma, *Staphlococcal* folliculitis | | |
| Endoparasite: *Oxyuris equi* | | |

Table 1: Differential diagnosis for equine pruritus.

## Infectious Dermatoses

*Pediculosis*: Both *Damalinia equi* (Figure 5) and *Haematopinus asini* are host specific obligate parasites, but are able to survive for a number of weeks in rugs and bedding. They are always spread by contact, and asymptomatic carriers exist. Due to the inability of lice to reproduce above 39°C, the incidence of pediculosis is much higher during the autumn and winter months. Young and geriatric animals are most often affected, likely due to the winter haircoat that is often not clipped in these animals. Topical treatment is recommended, but coat clipping is advisable to ensure penetration of insecticidal agents to the skin.

*Chorioptic mange: Chorioptes bovis* (feather mites) complete their life cycle on the host during a 3 week period but can survive in the environment for approximately 70 days, allowing for a significant degree of re-infestation if the environment is not treated. The limbs of the horse are predominantly affected, and sampling for mites is most easily achieved when the hair of the limb is short/clipped; long feathers inhibit capture of the mites by superficial brushing. Crusting and alopecia as a result of self-trauma is very common (Figure 6). Despite the classic presentation, sampling can sometimes prove unrewarding, which has led to suspicion on the authors part that some horses carry a degree of hypersensitivity to these mites, accounting for the excessive pruritic reaction, yet apparent low burden of mites.

*Trombiculidiasis*: Trombiculid adults and nymphs are free living, and normally found in areas based on chalky soil. Infestations tend to occur during the late summer and early autumn,

with larvae and nymphs identified in the serous ooze from pruritic lesions. However, due to their short feeding period on the host, locating larvae and adults can prove difficult.

*Oxyuris equi*: Female pinworms reside in the dorsal colon as adults, but deposit large numbers of eggs within the perianal region in what appears to be a suicidal event (Reinemeyer & Nielsen, 2014). The eggs are deposited using a highly proteinaceous fluid. This has been hypothesised to cause direct irritation to the skin, or possible immunogenic reaction. What is apparent is that some individuals do not display tail rubbing behaviour despite harbouring a pinworm burden. The identification of eggs on tape impression, or dead adults and proteinaceous material at the perianal region is indicative if infection, but it is not uncommon for owners to scupper this stage of investigation by washing the area prior to examination. Treatment is directed towards appropriate anthelmintic control, targeting egg laying adults. However, no anthelmintic product is currently recognised as specific for treatment of *Oxyuris equi*. As such, choosing an effective wormer can prove difficult, especially considering the continued threat of anthelmintic resistance. Oral administration is usually sufficient, but some clinicians advocate rectal administration of macrocyclic lactones or pyrantel embonate in an attempt to closer target egg laying adults.

The topic of anthelmintic resistance is unavoidable with regards to pruritus in the horse.

Although the majority of therapies for ectoparasites in the horse are topical, there has been a recent trend towards systemic application of macrocyclic lactones for a fast, albeit short-lived, treatment option. Not only is this product unlicensed for use in equine species, but its effect on intestinal helminths at the recommended subcutaneous dose is not well

completely unknown. It also allows for owners minimise their efforts towards prevention of the problem recurring.

| Condition | Drug | Product | Protocol |
|---|---|---|---|
| Pediculosis & Trombiculidiasis | 5% w/v Cyrpermethrin (cis:trans 50:50) | Deosect (Zoetis) | Apply to horse as a spray thoroughly twice, two weeks apart. |
| | 0.08% v/v Piperonyl butoxide 0.04 w/v pyrethrum extract | Dermoline Shampoo for Horses (Day Son and Hewitt) | Bath the horse thoroughly twice, two weeks apart. Leave applied for 20 minutes before rinsing. |
| Chorioptic mange | 1% Selenium Sulphide | Head and Shoulders Clinically Proven Solutions (P&G) | Bath affected arease thoroughly once a week for 4 weeks. Leave applied for 20 minutes before rinsing. |
| | 0.25% w/v Fipronil | Frontline Spray (Boehinger Ingleheim) | Apply generously to clipped limbs, until skin soaked. Wash limbs in shampoo prior to application. |
| | 10mg/ml Doramectin | Dectomax (Elanco) | 2 subcutaneous injections at 0.3mg/Kg, two weeks apart |
| | 5% Lime Sulphur Solution | LimePlus Dip (Dechra) | Wash limbs in shampoo prior to application of dip. 50ml diluted in 1 litre of water, applied to the affected region. Do not rinse. |
| Culicoides hypersensitivity | 25% Benzyl benzoate | Killitch (Car & Day & Martin) | Pour on over mane and tail head and work in. |
| | 4% w/v Permethrin (cis:trans 80:20) | Switch (Day Son & Hewitt) | Pour on over mane and tail head and work in. |

Table 2: Common medical therapies used for ectoparasite control.

Parasitic causes of pruritus are often contagious, and decontamination of stabling facilities is of upmost importance. Clearing bedding and washing down floors and walls with a commercial bleach product is usually sufficient. The frustrating treatment point is in-contact animals, and their associated stabling, which is often adjacent to that of the treated animal. Many animals may be asymptomatic carriers, especially with regards to chorioptic mites, and pinworm. As such, it is advisable to check in-contact animals and to advise control in an appropriate and sympathetic manner.

*Pyoderma and Dermatophytosis*: Skin infections involving bacteria or fungi are very variable in their pruritic level, and can present as more painful than itchy. However, bacterial infections can often be secondary to trauma following pruritus (Figure 7), and *Malassezia* overgrowth in the intermammary region of mares has been reported to be intensely pruritic. These cases result in tail rubbing and irritation of the abdomen (White et al, 2006). Identification of infectious microorganisms relies on cytology for basic diagnosis, which can then lead to topical therapy. Deep fungal infections require a biopsy culture for confirmation of diagnosis.

Although systemic antimicrobials can be efficacious in pyoderma cases, they can be associated with adverse events, and increased costs of treatment. An added concern is that of antimicrobial resistance following their systemic use. As such, the use of topical agents for the treatment of superficial bacterial infections is preferable. A plethora of products are available, although with limited evidence for their efficacy. However, review of the use of

chlorhexidine, benzoyl peroxide, sodium hypochlorite, and silver sulfadiazine in small animal practice can be easily translated into equine practice (Mueller et al., 2012) (Table 3).

Table 3: Commonly used topical antimicrobial agents.

| **Drug** | **Product** | **Product** |
|---|---|---|
| Chlorhexidine gluconate, Miconazole nitrate | Malaseb (Dechra) | Wet the area thoroughly. Massage into affected region, and leave to stand for 10 minutes before rinsing. Apply twice a week for 4 weeks. |
| Benzoyl peroxide | Paxutol (Virbac) | Bathe area for 5 minutes, followed by 10 minutes of contact time prior to washing through. Apply twice a week for 4 weeks. |
| Sodium hypocholrite | Vetericyn Spray (Innovacyn) | Spray onto affected region once a day until lesion resolves. |
| Silver sulfadiazine | Flamzine cream (Smith and Nephew) | Apply cream to affected region twice a day. Activity can be enhanced through application following treatment with chlorhexidine or benzoyl peroxide. |

The treatment of fungal infections in horses can vary. Superficial dermatophytosis is usually self-limiting, but topical treatment is often pursued to help hasten recovery from this highly contagious condition. Topical 2% enilconazole (Imaverol; Elanco) is the most popular solution, but hlorhexidine gluconate and miconazole nitrate (Malaseb; Dechra) at 2-4% can also be considered effectiveTreatment of deep mycosis is more frustrating, and the use of systemic antifungals is both lacking in evidence and expensive. Griseofulvin (5–10 mg/kg or 100 mg/kg by mouth every 24 hours) is occasionally used.

## Allergenic Dermatoses

Despite the high prevalence of *Culicoides* hypersensitivity within the equine population (which is often diagnosed on clinical signs alone) (Figure 8), other cutaneous manifestations of hypersensitivities are relatively rare. Pruritus and urticaria are the common clinical presentations of both equine food allergy and equine atopy. To distinguish between the two, horses can be fed a novel exclusion diet to aid in the diagnosis of feed allergy. This can be made up of 5-10Kg of Lucerne nuts per day for 4-6 weeks. Many horses in the United Kingdom have not been exposed to Timothy hay, which is a suitable alternative to Lucerne nuts. Should the pruritus resolve, re-challenge introduction of previous feeds can be performed to identify the offending substance. Diagnosis by serology and intradermal tests are not well established for *Culicoides* hypersensitivity (Schaffartzik et al, 2012) and most serological reactions are considered to have poor reproducibility, failing to correlate with Intradermal Allergen Test (IDAT) (Figure 9). False-positive reactions are also considered common.

If pruritus persists despite performance of a food exclusion trial, then a diagnosis of equine atopy can be made. This can be seasonal or non-seasonal in appearance, depending on the allergens involved. Management of these cases can be divided into four broad categories:

*Allergen avoidance*: The most effective means of controlling an allergen, is to eliminate the causal factor. This is more easily said than done, and identifying allergens associated with atopy in horses is notoriously variable. The gold standard form of testing is the IDAT, and is

most commonly performed by referral dermatologists. Storage mites, moulds, danders, and pollens are considered the most important allergens to procure a reaction. However, a reaction to wool indicates to an owner that removal of their pet sheep from the premises would be advisable. Appropriate use of light weight wrap-rugs (Boett) can provide a suitable barrier to biting flies and *Culicoides* midges, especially when peak flight times during the twilight hours cannot be avoided. Any clothing utilised should be washed once a week at 60$^{o}$C to remove potential build-up of dust mite allergens. This is often onerous and time consuming for owners. Washing the horse once a week in shampoo is a suitable compromise, as it has other therapeutic benefits, as well as removing the allergens from the horse's skin.

*Barrier function*: Attempts to minimise trans-epidermal water loss in canine species is achieved through the use of topical shampoos containing linoleic acid, such as Allermyl (Virbac) or Coatex (VetPlus). Cooler seasons can inhibit owners from performing this. Dietary supplementation with essential fatty acids can also be attempted, and some success has been noted with supplements such as Flaxseed/Linseed oil. This supplement has one of the highest natural sources of alpha-linoleic acid, and can easily be introduced to the diet gradually.

*Allergen-specific immunotherapy (ASIT)*: Identification of causal antigens by IDAT is beneficial for the formulation of ASIT. Although very few blinded control trials exist to justify its use in horses, recent retrospective studies suggest some benefit to its use as an adjunctive therapy in allergic horses (Leoffler et al., 2018). ASIT is usually given by intradermal injection. No matter the protocol used, and the increment increase in dose, a

minimum of 12 months should be allowed to evaluate whether the treatment has been effective so as to avoid seasonal variation in allergen load. ASIT is also known to take up to 9 months to have a significant effect. Unfortunately, its use for *Culicoides* hypersensitivity has shown minimal benefit, nominally due to the lack of specificity regarding which *Culicoides* proteins are responsible for the hypersensitivity reaction, and the concentration of the proteins achieved in ASIT.

There is one published report regarding the use of a *Trichophyton spp.* vaccine (Insol Dermatophyton; Boehringer Ingelheim) to aid in minimising clinical signs of *Culicoides* hypersensitivity (Gehlen et al., 2016). Although the results were not significant, there is certainly potential basis for the vaccine constituents encouraging an immunomodulatory shift.

*Anti-inflammatory drug therapy:* Pharmacotherapy of skin allergies is applied in the majority of cases, at least in the initial stages of disease. Glucocorticoids tend to be the most appropriate and effective of treatments. Dexamethasone (0.05mg/ kg q 24-48h) or prednisolone (1.0mg/kg q 24h) are generally helpful, although the degree of resolution may depend on ongoing allergen exposure.

Several antihistamines, such as diphenhydramine (1.0mg/kg q 12h - 2mg/kg q 12h) or hydroxyzine (1.0mg/kg q 8-24h) may help in some cases alone, or alongside glucocorticoids. Similarly, use of the tricyclic antidepressant doxepin (1.0mg/kg q 12-24h - 2mg/kg q 12-24h) can at least to enable a reduced glucocorticoid dosage.

**Summary**

Pruritus in the equine patient is a condition that can be both simple, and frustrating to treat. Both thorough history taking, and even more thorough sampling is the main-stay of effective diagnosis and therapy. Treatment of parasitic diseases not only requires owners to be committed to on-going care, but also veterinarians to be responsible regarding their recommendation of topical products. Allergic dermatoses are undoubtedly challenging conditions to treat, but it is important to address the disease as a whole, as opposed to reliance on anti-inflammatory drug therapy.

**Word Count: 2755**

Figure 1: This chart demonstrates the most common differentials of equine pruritic disease, and their associated predilection sites. Atopic dermatitis, dermatophytosis, and pemphigus are associated to all sites and are generalised by nature.

Figure 2: A chorioptic mite under microscopy. Image provided by Fernando Malanana

Figure 3: A flow chart demonstrating the sequence of steps required for effective investigation of the pruritic horse.

Figure 4: A horse displaying severe abrasions as a result of paraneoplastic pruritus, secondary to a renal carcinoma. This horse was diagnosed on rectal palpation of the renal mass. Image provided by Fernando Malanana.

Figure 5: *Damalinia equi* louse identified on microscopy. The large head and mouth parts give this specimen the colloquial name of 'chewing louse'. Image provided by Fernando Malanana.

Figure 6: A cob gelding with alopecia, crusting, and hyperaemia of the medial metatarsal region secondary to rubbing as a result of *Chorioptes* infestation. Long feathered breeds are predisposed to this condition.

Figure 7: Traumatic superficial pyoderma over the left shoulder of a horse. This is a result of atopic dermatitis.

Figure 8: The same cob gelding displayed in Figure 5. The alopecic areas of mane and tail, brittle hair, and chronically thickened skin are indicative of lesions as a result of *Culicoides* hypersensitivity.

Figure 9: A sub-dermal IDAT being performed over the left-hand side of the neck in a horse.

## References

BERGVALL, K., (2005). Advances in acquisition, identification, and treatment of equine ectoparasites. *Clinical Techniques in Equine Practice*, *4*(4), pp.296-301.

GEHLEN, H., BRUNNER, M., KLIER, J. AND REESE, S., (2016). Therapy of summer eczema using Insol (R) Dermatophyton-a field study. *Pferdeheilkunde*, *32*(4), pp.306-315.

IKOMA, A., STEINHOFF, M., STÄNDER, S., YOSIPOVITCH, G. AND SCHMELZ, M., (2006). The neurobiology of itch. *Nature reviews neuroscience*, *7*(7), p.535.

KNOTTENBELT, D.C., (2012). The approach to the equine dermatology case in practice. *Veterinary Clinics of North America: Equine Practice*, *28*(1), pp.131-153

LOEFFLER, A., HERRICK, D., ALLEN, S. AND LITTLEWOOD, J.D., (2018). Long-term management of horses with atopic dermatitis in southeastern England: a retrospective questionnaire study of owners' perceptions. *Veterinary dermatology 9*: 526–e176.

MUELLER, R.S., BERGVALL, K., BENSIGNOR, E. AND BOND, R., (2012). A review of topical therapy for skin infections with bacteria and yeast. *Veterinary dermatology*, *23*(4), pp.330-e62.

REINEMEYER, C.R. AND NIELSEN, M.K., (2014). Review of the biology and control of Oxyuris equi. *Equine Veterinary Education*, *26*(11), pp.584-591.

SCHAFFARTZIK, A., HAMZA, E., JANDA, J., CRAMERI, R., MARTI, E. AND RHYNER, C., (2012). Equine insect bite hypersensitivity: what do we know?. *Veterinary immunology and immunopathology*, *147*(3), pp.113-126.

VANDENABEELE, S.I., WHITE, S.D., AFFOLTER, V.K., KASS, P.H. AND IHRKE, P.J., (2004). Pemphigus foliaceus in the horse: a retrospective study of 20 cases. *Veterinary dermatology*, *15*(6), pp.381-388.

WHITE, S.D., (2005). Advances in equine atopic dermatitis, serologic and intradermal allergy testing. *Clinical Techniques in Equine Practice*, *4*(4), pp.311-313.

WHITE, S.D., (2015). A diagnostic approach to the pruritic horse. *Equine Veterinary Education*, *27*(3), pp.156-166.

WHITE, S.D. VANDENABEELE, S.I.J., DRAZENOVICH, N.L. AND FOLEY, J.E., (2006). Malassezia species isolated from the intermammary and preputial fossa areas of horses. *Journal of veterinary internal medicine*, *20*(2), pp.395-398.

365

366

367

368

# Diagnosis and management of the itchy horse

Ben Curnow

benc@liv.ac.uk

07595940073

Leahurst Equine Practice, University of Liverpool, Chester High Road, Neston, Wirral CH64 2TN, United Kingdom

Word Count: 2958

# Diagnosis and management of the itchy horse


## Abstract

Out in the field, it can be particularly challenging to work up a case of the itchy horse. The history can be vague, the patient is large with a dense coat, and the microscope is located back at the practice. Management can also cause frustration for both the clinician and the client, with tasks that may be manageable for a dog and cat proving impractical in ponies and horses. The aim of this article is to outline some of the common causes of pruritus in horses, how to get an accurate diagnosis, and how to effectively treat them.


## Introduction

Although the definition of pruritus has been stated as the 'unpleasant sensation that triggers a desire to scratch' (Ikoma et al, 2006), scratching is not necessarily a clinical sign readily displayed by horses that are pruritic. They are far more likely to bite, rub, or chew at sites that are itchy, and these signs are considered indicative of pruritus in equine medicine. The presentation of pruritus in horses is highly distressing to owners. Not only can the horse inflict a significant degree of self-trauma, but paddock fencing, field shelters, and even expensive rugs will not go unharmed in a horse's attempt to resolve a persistent itch. Home therapies are numerous, and it is rare that clinicians are not presented with a patient that has not already been bathed in shampoo or cream that may or may not have ingredients stated on the bottle. Therefore, a good history is paramount, followed by a suitable clinical examination and sampling. Most dermatological samples obtained from a primary visit can

be interpreted in-house for a very limited cost. All that is required is a decent microscope, slides, and paraffin oil.

**History**

A thorough history should be acquired when dealing with a pruritic case. Signalment of a case is obviously important (age, breed, sex, etc), but much of what needs to be acquired can be ascertained from six questions (White, 2015):

- Check that the horse is pruritic. Pruritus often presents with chewing/biting, stamping, or rubbing. This can be focal or generalised in distribution, with many secondary skin changes appearing from self-inflicted trauma.
- How did the problem present and how has it changed?
- How has the owner treated the horse, and what effect has this had? This is especially important, as owners will have inevitably applied something to the skin, whether ingredients are stated on the bottle, or not.
- What is the horse's normal routine and environment? It is also important to gauge whether or not the horse has contact with other horses, and if any other in-contacts (horses/humans) are affected regarding contagion.
- What is the horse's diet (including turnout pasture)?
- Is there a seasonality to the horse's pruritus, or any potential triggers?

**Physical Examination**

A general examination of the horse is vital. This could reveal indicators of another cause for dermatological disease and pruritus, such as pars pituitary intermedia dysfunction (PPID), pemphigus foliaceus, or liver disease (Knottenbelt, 2012). It is important to move the horse

into a well-lit area for dermatological examination, not only to identify any possible ectoparasites, but to characterise the lesions and clinical pattern of the case presentation.

It is imperative to discern whether the pruritus is generalised or focused to a particular bodily region. This can significantly affect the likelihood of certain differential diagnoses (Figure 1).

**What samples to take?**

**Infectious dermatoses**: Suspicion of parasitic cause for pruritus in equine species is of high priority, and sampling is relatively straight forward. Equipment required for sampling is listed in Box 1. Samples that should be taken upon an initial consultation are as follows:

- **Coat brushings**: Brush the coat using a stiff brush. The author prefers the use of a denture tooth brush, and a clear petri-dish for collection of extracted material. Follow this exercise by clipping the area brushed and repeating the brushing process. This can help to readily capture mites and lice hiding deeper beneath heavily coated/feathered areas (Bergvall, 2005).
- **Hair plucks:** These can be used for identification of louse eggs (Bergvall, 2005). Should dermatophytosis be suspected, peripheral lesion hair plucks can be submitted for rapid dermatophyte qPCR, or fungal culture as a gold standard. These should be stored in a sterile bottle or paper envelope for transport.
- **Tape strips**: Acetate tape strips can be applied to pruritic areas for use in identifying mites and lice. In cases of tail head/rump pruritus, it is imperative to sample the

perianal area with scotch tape to identify *Oxyuris equi* eggs (Reinemeyer & Nielsen, 2014).

- **Cytology**: Exudative lesions can readily be sampled by impression smear onto a microscope slide or acetate tape, and cytology of the impression viewed by Wright-Giemsa (Diff-Quik) stain. This technique is particularly useful in gaining a rapid diagnosis of pyoderma.

Box 1: A consolidated list of items that are useful for dermatological investigations.

- Sellotape
- Scissors
- Microscopy Slides
- Paraffin Oil + Pipette
- Scalpel Blades
- Artery Forceps
- Denture Toothbrush
- Petri-dish
- Local Anaesthetic
- Biopsy Punch (6-8mm)
- Microbiological Swabs
- Sampling Pots

| Infectious | Immunological | Miscellaneous |
|---|---|---|
| Lice: *Haematopinus asini*, *Damalinia equi* | Atopic Dermatitis | Drug reaction |
| Mites: *Chorioptes spp*, *Sarcoptes scabei*, *Trombicula autumnalis*, *Dermanyssus gallinae* | *Culicoides* hypersesnitivity | Hepatic dysfunction |
| Biting flies and insects | Contact hypersensitivity | Multisystemic eosinophilic epitheliotropic syndrome |
| Fungal: Dermatophilosis, *Malassezia* dermatitis | Food allergy | Paraneoplastic pruritus |
| Bacteria: Dermatophytosis, | | |

Should these samples not produce a significant diagnosis, the second consultation should involve the collection of **skin scrapings** and possible **punch biopsy**, depending on the clinical picture. Superficial scrapes can be used to identify parasites such as *Chorioptes spp* (Figure 2) and *Trombicula autumnalis.* Deeper scrapings can be used for identification of burrowing mites, such as *Demodex spp*, which could be suspected in PPID or systemically compromised patients (Bergvall, 2005) (Knottenbelt, 2012). Demodicosis is exceptionally rare in equine patients~~, but are exceptionally rare in the equine patient~~. If no parasites can be identified, it is still justified to treat for parasitic causes prior to investigation of other pruritic diseases (Figure 3). Tissue culture can be performed from punch biopsy should dermatophilosis be suspected. Multiple punch biopsies (at least 12) should be taken following cytological indication if an attempt to diagnose pemphigus foliaceus is to be made (Vandenabeele et al, 2004). This will normally present with crusting and possible pruritus. Other rare causes of pruritus, such as hepatocutaneous syndrome or paraneoplastic pruritus (Figure 4), require further blood work to aid in diagnosis, and even possible rectal palpation and abdominal ultrasonography.

The most common parasitic and infectious aetiologies are outlined below (Table 1), along with their appropriate treatments (Table 2).

| | | |
|---|---|---|
| pyoderma, *Staphlococcal* folliculitis | | |
| Endoparasite: *Oxyuris equi* | | |

Table 1: Differential diagnosis for equine pruritus.

**Infectious Dermatoses**

*Pediculosis*: Both *Damalinia equi* (Figure 5) and *Haematopinus asini* are host specific obligate parasites, but are able to survive for a number of weeks in rugs and bedding. They are always spread by contact, and asymptomatic carriers exist. Due to the inability of lice to reproduce above 39ºC, the incidence of pediculosis is much higher during the autumn and winter months. Young and geriatric animals are most often affected, likely due to the winter haircoat that is often not clipped in these animals. Topical treatment is recommended, but coat clipping is advisable to ensure penetration of insecticidal agents to the skin.

*Chorioptic mange: Chorioptes bovis* (feather mites) complete their life cycle on the host during a 3 week period but can survive in the environment for approximately 70 days, allowing for a significant degree of re-infestation if the environment is not treated. The limbs of the horse are predominantly affected, and sampling for mites is most easily achieved when the hair of the limb is short/clipped; long feathers inhibit capture of the mites by superficial brushing. Crusting and alopecia as a result of self-trauma is very common (Figure 6). Despite the classic presentation, sampling can sometimes prove unrewarding, which has led to suspicion on the authors part that some horses carry a

degree of hypersensitivity to these mites, accounting for the excessive pruritic reaction, yet apparent low burden of mites.

*Trombiculidiasis*: Trombiculid adults and nymphs are free living, and normally found in areas based on chalky soil. Infestations tend to occur during the late summer and early autumn, with larvae and nymphs identified in the serous ooze from pruritic lesions. However, due to their short feeding period on the host, locating larvae and adults can prove difficult.

*Oxyuris equi*: Female pinworms reside in the dorsal colon as adults, but deposit large numbers of eggs within the perianal region in what appears to be a suicidal event (Reinemeyer & Nielsen, 2014). The eggs are deposited using a highly proteinaceous fluid. This has been hypothesised to cause direct irritation to the skin, or possible immunogenic reaction. What is apparent is that some individuals do not display tail rubbing behaviour despite harbouring a pinworm burden. The identification of eggs on tape impression, or dead adults and proteinaceous material at the perianal region is indicative of infection, but it is not uncommon for owners to scupper this stage of investigation by washing the area prior to examination. Treatment is directed towards appropriate anthelmintic control, targeting egg laying adults. However, no anthelmintic product is currently recognised as specific for treatment of *Oxyuris equi*. As such, choosing an effective wormer can prove difficult, especially considering the continued threat of anthelmintic resistance. ~~Oral administration is usually sufficient, but some clinicians advocate rectal administration of macrocyclic lactones or pyrantel embonate in an attempt to closer target egg laying adults~~. There appear to be fewest reports of benzimidazole resistance in cases of pinworm. It may therefore be appropriate to treat affected horses with repeated doses of anthelmintics such that younger

L4 larvae are killed as they mature. At present, the author uses 3 doses of fenbendazole or pyrantel embonate, at 2–3 week intervals in persistent severely affected cases. The use of rectally administered or perianal topical anthelminthics is sometimes suggested, but it is unclear if these are beneficial.

~~The topic of anthelmintic resistance is unavoidable with regards to pruritus in the horse.~~

Although the majority of therapies for ectoparasites in the horse are topical, ~~there has been a recent trend towards~~ systemic application of doramectin~~macrocyclic lactones~~ offers ~~for~~ a fast, temporary resolution of ~~albeit short-lived, t~~ *Chorioptes* mites (Rendle et al., 2007)~~reatment option~~. Not only is this product unlicensed for use in equine species, but its effect on intestinal helminths at the recommended subcutaneous dose is not well documented~~completely unknown~~ in horses, despite common use of avermectins in the control of parasitism in livestock animals (Baltzell et al., 2015). Implications, such as anthelmintic resistance, should be considered when selecting doramectin for use in horses.~~It also allows for owners minimise their efforts towards prevention of the problem recurring.~~

| Condition | Drug | Product | Protocol |
|---|---|---|---|
| Pediculosis & Trombiculidiasis | 5% w/v Cyrpermethrin (cis:trans 50:50) | Deosect (Zoetis) | Apply to horse as a spray thoroughly twice, two weeks apart. |
| | 0.08% v/v Piperonyl butoxide 0.04 w/v pyrethrum extract | Dermoline Shampoo for Horses (Day Son and Hewitt) | Bath the horse thoroughly twice, two weeks apart. Leave applied for 20 minutes before rinsing. |
| Chorioptic mange | 1% Selenium Sulphide | Head and Shoulders Clinically Proven Solutions (P&G) | Bath affected arease thoroughly once a week for 4 weeks. Leave applied for 20 minutes before rinsing. |
| | 0.25% w/v Fipronil | Frontline Spray (Boehinger Ingleheim) | Apply generously to clipped limbs, until skin soaked. Wash limbs in shampoo prior to application. |
| | 10mg/ml Doramectin | Dectomax (Elanco) | 2 subcutaneous injections at 0.3mg/Kg, two weeks apart |
| | 5% Lime Sulphur Solution | LimePlus Dip (Dechra) | Wash limbs in shampoo prior to application of dip. 50ml diluted in 1 litre of water, applied to the affected region. Do not rinse. |
| Culicoides hypersensitivity | 25% Benzyl benzoate | Killitch (Car & Day & Martin) | Pour on over mane and tail head and work in. |
| | 4% w/v Permethrin (cis:trans 80:20) | Switch (Day Son & Hewitt) | Pour on over mane and tail head and work in. |

Table 2: Common medical therapies used for ectoparasite control.

Parasitic causes of pruritus are often contagious, and decontamination of stabling facilities is of upmost importance. Clearing bedding and washing down floors and walls with a commercial bleach product is usually sufficient. The frustrating treatment point is in-contact animals, and their associated stabling, which is often adjacent to that of the treated animal. Many animals may be asymptomatic carriers, especially with regards to chorioptic mites, and pinworm. As such, it is advisable to check in-contact animals and to advise control in an appropriate and sympathetic manner.

*Pyoderma ~~and Dermatophytosis~~*: Skin infections involving bacteria ~~or fungi~~ are very variable in their pruritic level, and can present as more painful than itchy. However, bacterial infections can often be secondary to trauma following pruritus (Figure 7), and ~~*Malassezia* overgrowth in the intermammary region of mares has been reported to be intensely pruritic. These cases result in tail rubbing and irritation of the abdomen (White et al, 2006)~~. Identification of infectious microorganisms relies on cytology for basic diagnosis, which can then lead ~~to~~ topical therapy. Impression smears or tape impressions are a useful first line test, which can later be followed by tissue biopsy if the investigation requires it. ~~Deep fungal infections require a biopsy culture for confirmation of diagnosis.~~

Although systemic antimicrobials can be efficacious in pyoderma cases, they can be associated with adverse events, and increased costs of treatment. An added concern is that of antimicrobial resistance following their systemic use. As such, the use of topical agents for the treatment of superficial bacterial infections is preferable. A plethora of products are available, although with limited evidence for their efficacy. However, review of the use of

chlorhexidine, benzoyl peroxide, sodium hypochlorite, and silver sulfadiazine in small animal practice can be easily translated into equine practice (Mueller et al., 2012) (Table 3).

Table 3: Commonly used topical antimicrobial agents.

| Drug | Product | Product |
|---|---|---|
| Chlorhexidine gluconate, Miconazole nitrate | Malaseb (Dechra) | Wet the area thoroughly. Massage into affected region, and leave to stand for 10 minutes before rinsing. Apply twice a week for 4 weeks. |
| Benzoyl peroxide | Paxutol (Virbac) | Bathe area for 5 minutes, followed by 10 minutes of contact time prior to washing through. Apply twice a week for 4 weeks. |
| Sodium hypocholrite | Vetericyn Spray (Innovacyn) | Spray onto affected region once a day until lesion resolves. |
| Silver sulfadiazine | Flamzine cream (Smith and Nephew) | Apply cream to affected region twice a day. Activity can be enhanced through application following treatment with chlorhexidine or benzoyl peroxide. |

*Fungal Infection:* ~~Rarely is~~ In the horse, dermatophytosis is rarely pruritic. ~~in the horse.~~

Superficial dermatophytosis more commonly presents with crusting, in association with alopecia that can be generalised, or more focal in nature ('ringworm'). Diagnosis is achieved

**Commented [CH1]:** maybe rephrase

via PCR or culture of plucked hairs from the periphery of the lesions. Deep fungal infections require a biopsy culture for confirmation of diagnosis.

*Malassezia* overgrowth in the intermammary region of mares has been reported to be intensely pruritic. These cases result in tail rubbing and irritation of the abdomen (White et al, 2006)

The treatment of fungal infections in horses can vary. Superficial dermatophytosis is usually self-limiting, but topical treatment is often pursued to help hasten recovery from this highly contagious condition. Topical 2% enilconazole (Imaverol; Elanco) is the most popular solution, and is applied to the affected areas four times with 3-4 day intervals. ~~but~~ Chlorhexidine gluconate and miconazole nitrate (Malaseb; Dechra) at 2-4% can ~~also~~ be considered effective, and is effective in the treatment of intermammary *Malassezia.* Treatment of deep mycosis is more frustrating, and the use of systemic antifungals is both lacking in evidence and expensive. Griseofulvin (5–10 mg/kg or 100 mg/kg by mouth every 24 hours) is occasionally used, but precautions should be taken regarding its use in pregnant animals, and handling by pregnant women, due to potential teratogenic effects.

**Allergenic Dermatoses**

Despite the high prevalence of *Culicoides* hypersensitivity within the equine population (which is often diagnosed on clinical signs alone) (Figure 8), other cutaneous manifestations of hypersensitivities are relatively rare. Pruritus and urticaria are the common clinical presentations of both equine food allergy and equine atopy. To distinguish between the two, horses can be fed a novel exclusion diet to aid in the diagnosis of feed allergy. This can

be made up of 5-10Kg of Lucerne nuts per day for 4-6 weeks. Many horses in the United Kingdom have not been exposed to Timothy hay, which is a suitable alternative to Lucerne nuts. Should the pruritus resolve, re-challenge introduction of previous feeds can be performed to identify the offending substance. Diagnosis by serology and intradermal tests are not well established for *Culicoides* hypersensitivity (Schaffartzik et al, 2012) and most serological reactions are considered to have poor reproducibility, failing to correlate with Intradermal Allergen Test (IDAT) (Figure 9). False-positive reactions are also considered common.

If pruritus persists despite performance of a food exclusion trial, then a diagnosis of equine atopy can be made. This can be seasonal or non-seasonal in appearance, depending on the allergens involved. Management of these cases can be divided into four broad categories:

*Allergen avoidance*: The most effective means of controlling an allergen, is to eliminate the causal factor. This is more easily said than done, and identifying allergens associated with atopy in horses is notoriously variable. The gold standard form of testing is the IDAT, and is most commonly performed by referral dermatologists. Storage mites, moulds, danders, and pollens are considered the most important allergens to procure a reaction. ~~However, a reaction to wool indicates to an owner that removal of their pet sheep from the premises would be advisable.~~ Appropriate use of light weight wrap-rugs (Boett) can provide a suitable barrier to biting flies and *Culicoides* midges, especially when peak flight times during the twilight hours cannot be avoided. Any clothing utilised should be washed once a week at 60°C to remove potential build-up of dust mite allergens. This is often onerous and time consuming for owners. Washing the horse once a week in shampoo is a suitable

compromise, as it has other therapeutic benefits, as well as removing the allergens from the horse's skin.

*Barrier function*: Attempts to minimise trans-epidermal water loss in canine species is achieved through the use of topical shampoos containing linoleic acid, such as Allermyl (Virbac) or Coatex (VetPlus). Cooler seasons can inhibit owners from performing this. Dietary supplementation with essential fatty acids can also be attempted, and some success has been noted with supplements such as Flaxseed/Linseed oil. This supplement has one of the highest natural sources of alpha-linoleic acid, and can easily be introduced to the diet gradually.

*Allergen-specific immunotherapy (ASIT)*: Identification of causal antigens by IDAT is beneficial for the formulation of ASIT. Although very few blinded control trials exist to justify its use in horses, recent retrospective studies suggest some benefit to its use as an adjunctive therapy in allergic horses (Leoffler et al., 2018). ASIT is usually given by intradermal injection. No matter the protocol used, and the increment increase in dose, a minimum of 12 months should be allowed to evaluate whether the treatment has been effective so as to avoid seasonal variation in allergen load. ASIT is also known to take up to 9 months to have a significant effect. Unfortunately, its use for *Culicoides* hypersensitivity has shown minimal benefit, nominally due to the lack of specificity regarding which *Culicoides* proteins are responsible for the hypersensitivity reaction, and the concentration of the proteins achieved in ASIT.

There is one published report regarding the use of a *Trichophyton spp.* vaccine (Insol Dermatophyton; Boehringer Ingelheim) to aid in minimising clinical signs of *Culicoides*

hypersensitivity (Gehlen et al., 2016). TAlthough the results were not significant, but there wasthere is discussion of acertainly potential basis for the vaccine constituents encouraging an immunomodulatory shift. Considering the added requirements for importing the product to the UK, the potential for injection site reactions, and the off-licence use of the vaccine, there is little to justify the use of this product in the therapy of *Culicoides* hypersensitivity.

*Anti-inflammatory drug therapy:* Pharmacotherapy of skin allergies is applied in the majority of cases, at least in the initial stages of disease. Glucocorticoids tend to be the most appropriate and effective of treatments. Dexamethasone (0.05mg/ kg q 24-48h) or prednisolone (1.0mg/kg q 24h) are generally helpful, although the degree of resolution may depend on ongoing allergen exposure.

Several antihistamines, such as diphenhydramine (1.0mg/kg q 12h - 2mg/kg q 12h) or hydroxyzine (1.0mg/kg q 8-24h) may help in some cases alone, or alongside glucocorticoids. Similarly, use of the tricyclic antidepressant doxepin (1.0mg/kg q 12-24h - 2mg/kg q 12-24h) can at least to enable a reduced glucocorticoid dosage.

**Summary**

Pruritus in the equine patient is a condition that can be both simple, and frustrating to treat. Both thorough history taking, and even more thorough sampling is the main-stay of effective diagnosis and therapy. Treatment of parasitic diseases not only requires owners to be committed to on-going care, but also veterinarians to be responsible regarding their recommendation of topical products. Allergic dermatoses are undoubtedly challenging conditions to treat, but it is important to address the disease as a whole, as opposed to reliance on anti-inflammatory drug therapy. Both licenced and unlicensed therapeutics exist

when treating the pruritic horse. As such, it is important to follow the cascade when formulating a treatment protocol.

**Word Count: 2958755**

Figure 1: This chart demonstrates the most common differentials of equine pruritic disease, and their associated predilection sites. Atopic dermatitis, dermatophytosis, and pemphigus are associated to all sites and are generalised by nature.

Figure 2: A chorioptic mite under microscopy. Image provided by Fernando Malanana

Figure 3: A flow chart demonstrating the sequence of steps required for effective investigation of the pruritic horse.

Figure 4: A horse displaying severe abrasions as a result of paraneoplastic pruritus, secondary to a renal carcinoma. This horse was diagnosed on rectal palpation of the renal mass. Image provided by Fernando Malanana.

Figure 5: *Damalinia equi* louse identified on microscopy. The large head and mouth parts give this specimen the colloquial name of 'chewing louse'. Image provided by Fernando Malanana.

Figure 6: A cob gelding with alopecia, crusting, and hyperaemia of the medial metatarsal region secondary to rubbing as a result of *Chorioptes* infestation. Long feathered breeds are predisposed to this condition.

Figure 7: Traumatic superficial pyoderma over the left shoulder of a horse. This is a result of atopic dermatitis.

Figure 8: The same cob gelding displayed in Figure 5. The alopecic areas of mane and tail, brittle hair, and chronically thickened skin are indicative of lesions as a result of *Culicoides* hypersensitivity.

Figure 9: A sub-dermal IDAT being performed over the left-hand side of the neck in a horse.

**References**

BALTZELL, P., ENGELKEN, T. and O'CONNOR, A.M., (2015). A critical review and meta-analysis of the magnitude of the effect of anthelmintic use on stocker calf production parameters in Northern US States. *Veterinary parasitology*, *214*(1-2), pp.2-11.

BERGVALL, K., (2005). Advances in acquisition, identification, and treatment of equine ectoparasites. *Clinical Techniques in Equine Practice*, *4*(4), pp.296-301.

GEHLEN, H., BRUNNER, M., KLIER, J. AND REESE, S., (2016). Therapy of summer eczema using Insol (R) Dermatophyton-a field study. *Pferdeheilkunde*, *32*(4), pp.306-315.

IKOMA, A., STEINHOFF, M., STÄNDER, S., YOSIPOVITCH, G. AND SCHMELZ, M., (2006). The neurobiology of itch. *Nature reviews neuroscience*, *7*(7), p.535.

KNOTTENBELT, D.C., (2012). The approach to the equine dermatology case in practice. *Veterinary Clinics of North America: Equine Practice*, *28*(1), pp.131-153

LOEFFLER, A., HERRICK, D., ALLEN, S. AND LITTLEWOOD, J.D., (2018). Long-term management of horses with atopic dermatitis in southeastern England: a retrospective questionnaire study of owners' perceptions. *Veterinary dermatology 9*: 526–e176.

MUELLER, R.S., BERGVALL, K., BENSIGNOR, E. AND BOND, R., (2012). A review of topical therapy for skin infections with bacteria and yeast. *Veterinary dermatology*, *23*(4), pp.330-e62.

REINEMEYER, C.R. AND NIELSEN, M.K., (2014). Review of the biology and control of Oxyuris equi. *Equine Veterinary Education*, *26*(11), pp.584-591.

RENDLE, D.I., COTTLE, H.J., LOVE, S. and HUGHES, K.J., (2007). Comparative study of doramectin and fipronil in the treatment of equine chorioptic mange. *Veterinary Record*, *161*(10), pp.335-338.

SCHAFFARTZIK, A., HAMZA, E., JANDA, J., CRAMERI, R., MARTI, E. AND RHYNER, C., (2012). Equine insect bite hypersensitivity: what do we know?. *Veterinary immunology and immunopathology*, *147*(3), pp.113-126.

VANDENABEELE, S.I., WHITE, S.D., AFFOLTER, V.K., KASS, P.H. AND IHRKE, P.J., (2004). Pemphigus foliaceus in the horse: a retrospective study of 20 cases. *Veterinary dermatology*, *15*(6), pp.381-388.

WHITE, S.D., (2005). Advances in equine atopic dermatitis, serologic and intradermal allergy testing. *Clinical Techniques in Equine Practice*, *4*(4), pp.311-313.

WHITE, S.D., (2015). A diagnostic approach to the pruritic horse. *Equine Veterinary Education*, *27*(3), pp.156-166.

WHITE, S.D. VANDENABEELE, S.I.J., DRAZENOVICH, N.L. AND FOLEY, J.E., (2006). Malassezia species isolated from the intermammary and preputial fossa areas of horses. *Journal of veterinary internal medicine*, *20*(2), pp.395-398.

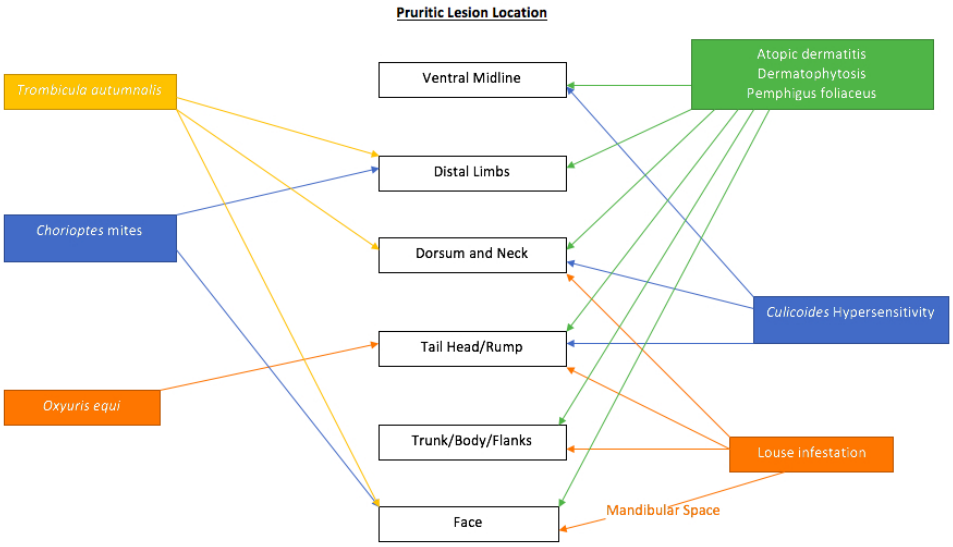


Figure1: This chart demonstrates the most common differentials of equine pruritic disease, and their associated predilection sites. Atopic dermatitis, dermatophytosis, and pemphigus are associated to all sites and are generalised by nature.

323x198mm (72 x 72 DPI)

Figure 2: A chorioptic mite under microscopy. Image provided by Fernando Malanana

451x338mm (72 x 72 DPI)

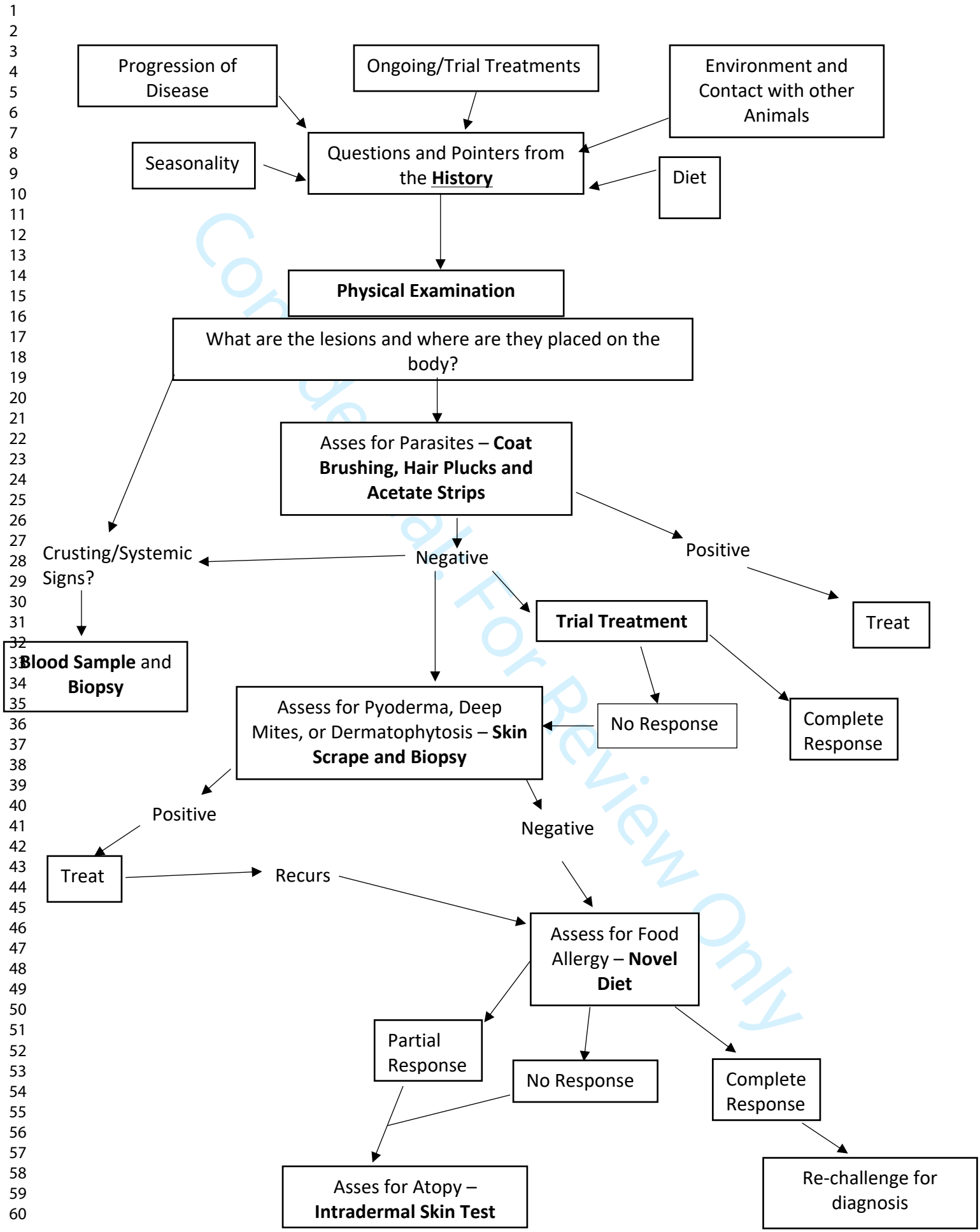

Figure 4: A horse displaying severe abrasions as a result of paraneoplastic pruritus, secondary to a renal carcinoma. This horse was diagnosed on rectal palpation of the renal mass. Image provided by Fernando Malanana.

254x169mm (300 x 300 DPI)

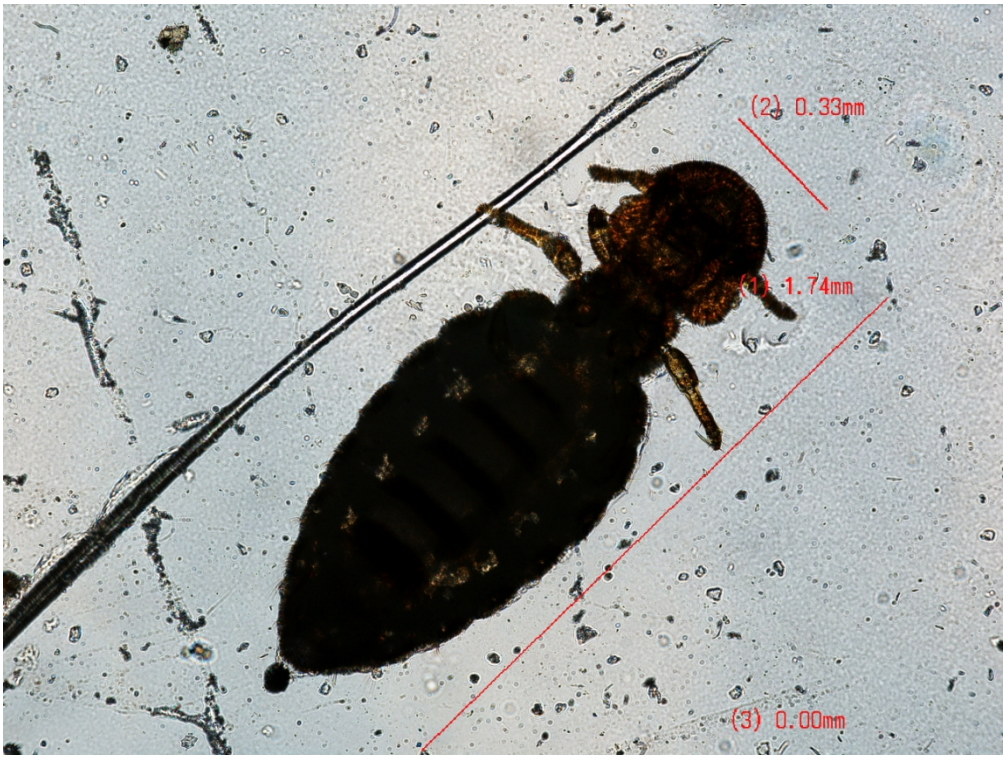


Figure 5: Damalinia equi louse identified on microscopy. The large head and mouth parts give this specimen the colloquial name of 'chewing louse'. Image provided by Fernando Malanana.

451x338mm (72 x 72 DPI)

Figure 6: A cob gelding with alopecia, crusting, and hyperaemia of the medial metatarsal region secondary to rubbing as a result of Chorioptes infestation. Long feathered breeds are predisposed to this condition.

295x196mm (72 x 72 DPI)

Figure 7: Traumatic superficial pyoderma over the left shoulder of a horse. This is a result of atopic dermatitis.

159x212mm (72 x 72 DPI)

Figure 8: The same cob gelding displayed in Figure 2. The alopecic areas of mane and tail, brittle hair, and chronically thickened skin are indicative of lesions as a result of Culicoides hypersensitivity.

312x210mm (72 x 72 DPI)

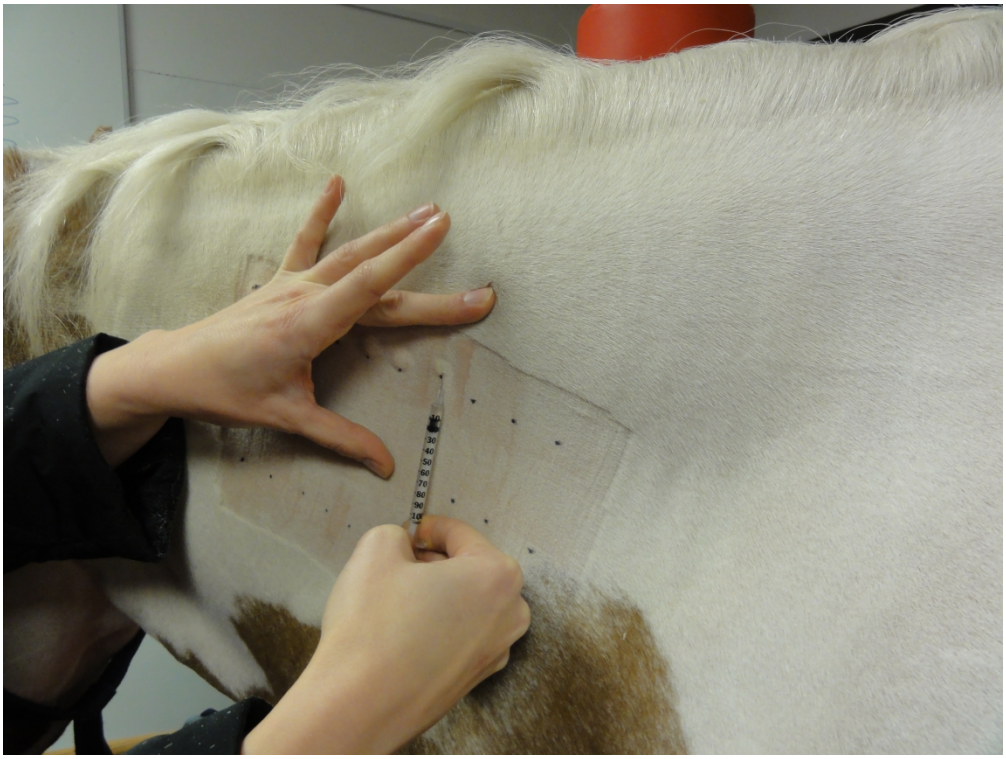

Figure 9: A sub-dermal IDAT being performed over the left-hand side of the neck in a horse.

1286x965mm (72 x 72 DPI)

**Quiz**

**1)** At what maximal temperature are lice inhibited from reproducing?

**a.** $30^0$C

**b.** $39^0$C

**c.** $46^0$C

**d.** $28^0$C

**Answer: B**

**2)** What vaccine has been suggested to minimise hypersensitivity reactions associated with insect hypersensitivity?

**a.** Tetanus toxoid

b. Equine Herpes Virus 1 + 4

c. Equine Influenza

d. Trichophyton spp

**Answer: D**

**3)** What feed stuffs can commonly be utilised in a dietary exclusion trial when trying to establish a food allergy in horses?

**a.** Timothy Hay

**b.** Lucerne nuts

**c.** Meadow Hay

**d.** Alfalfa

**Answer: A + B**